

Loblolly Block Planting



Purpose: To establish a demonstration planting for landowner outreach using a range of loblolly planting stock. This is an operational planting and it is not intended to replace replicated research studies.

Soil Description: Lynchburg loamy fine sand. Deep, somewhat poorly drained soil, with water table 0.5' to 1.5' below the surface in winter and spring. Medium in natural fertility and low in organic matter content. Site Index: 86.

Stand Establishment: Site was burned (\$15/acre) & bedded (\$30/acre) prior to planting in early 2007. Four adjacent blocks were planted on 9.5 ft x 8 ft spacing with different loblolly seedling source material: 1) ArborGen rooted cuttings, 2) Cellfor Q3802, 3) SCFC 2nd Generation Coastal Best Family, and 4) SCFC 2nd Generation Rust Resistant Mix. Planting density was 573 TPA. Stand establishment costs varied only by cost of planting stock. Seedling costs ranged from \$400 per 1000 (\$400/1K) for Q3802 to \$47/1K for the Rust Resistant Mix. Beds were sprayed with Oustar in 2007 for 1st year weed control (\$55/ac). Total establishment costs range from \$377/ac (Q3802) to \$120/ac (RR Mix).

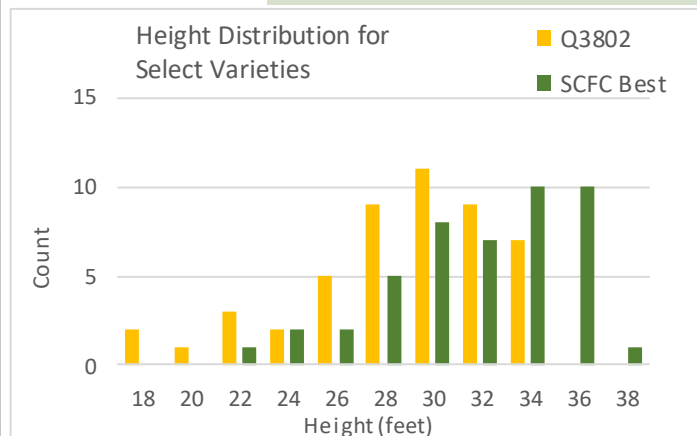
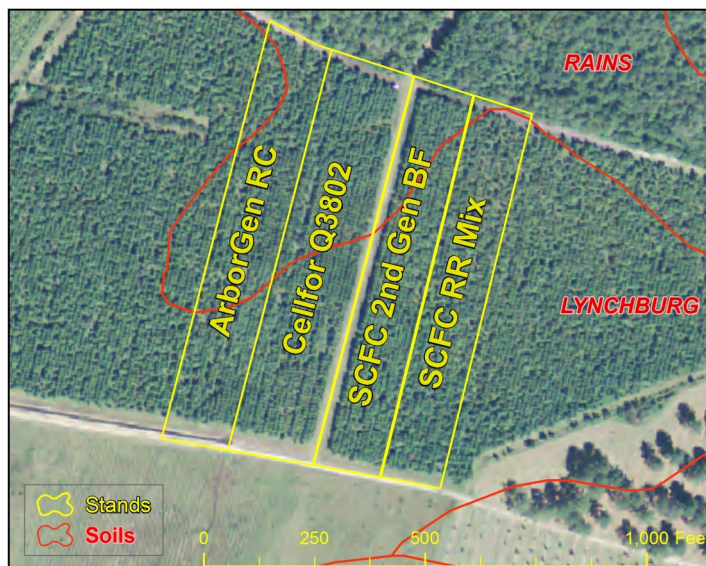
Variety	Ht (ft)	DBH (in)	Rust (% infected)	Straight* (rank)	Fork/Ram** (% impacted)	Vol (tons/acre)
ArborGen RC	31.0	5.3	2.1	2.2	18.4	55.3
SCFC 2nd Gen BF	31.4	5.6	30.4	2.1	4.0	54.7
SCFC RR Mix	30.5	5.6	12.5	1.9	8.0	51.2
Cellfor Q3802	28.2	4.8	0.0	1.7	12.0	46.0

*Straightness ranks stems 1 (good quality) to 4 (poor quality). **Ramicorn is defined as large, high-angled branching.

Summary: Cellfor Q3802 trees, while lower in volume, displayed better form and rust resistance compared to the other selections. SCFC 2nd Generation Coastal Best Family showed excellent volume growth, but less rust resistance, and generally poorer form (straightness).



After two growing seasons, the SCFC 2nd Gen BF and Cellfor Q3802 averaged 4.9' and 4.8' tall, respectively. Pictured above are the tallest seedlings measured at age 2.



Q3802 varietal exhibited a normal distribution, while SCFC Best showed greater percentage of growing stock in larger height classes.

FlexStand Biomass Study



Purpose: To demonstrate the concept of growing two tree varieties in alternating rows for biomass and higher-value products.

Soil Description: Planting site dominated by Lynchburg and Norfolk (NoA) loamy fine sands (described elsewhere). A depression with high water table impacted the growth of seedlings in the Cellfor Q3802 block.

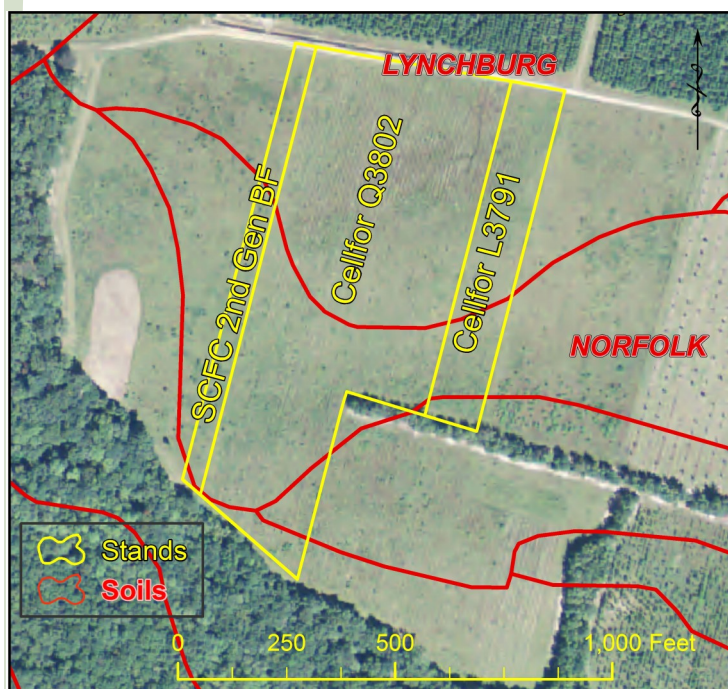
Stand Establishment: Site preparation included burning, scalping, and sub-soiling (total \$76/acre). Planting was conducted in Spring of 2012 (\$60/acre). No fertilization or herbicides were applied. Seedling costs were \$228/1K for Cellfor varieties L3791 and Q3802, and \$60/1K for SCFC 2nd Generation Coastal Best Family. Total establishment costs ranged from \$365/ac (L3791 & Q3802) to \$163/ac (SCFC).

The FlexStand design allows for a 5 ft in-row spacing for biomass rows (harvested in the first thinning) and a 10 ft in-row spacing for the rotation-length rows (see illustration). All rows are planted 10 ft apart. All biomass trees were planted with SCFC 2nd Generation Best Family seedlings. The rotation-length rows were planted with the seedling varieties identified in the map below. Planting density is 654 trees/acre (436 trees/acre of biomass seedlings and 218 trees/acre of rotation-length seedlings).

Seedling Variety	Ht (ft)	GLD (in.)	Rust (%)	Surv. (%)
Cellfor L3791	7.7	1.8	0	100
SCFC 2nd Gen BF	6.2	1.4	17.4	97.8

*GLD = Ground Line Diameter.

Summary: Cellfor L3791 seedlings were significantly taller at year two, with high survival for both varieties. Site variability and weather impacts inhibited data collection on the Q3802 block.



Cellfor seedling at planting, with bare soil conditions and site-prep scalping evident.

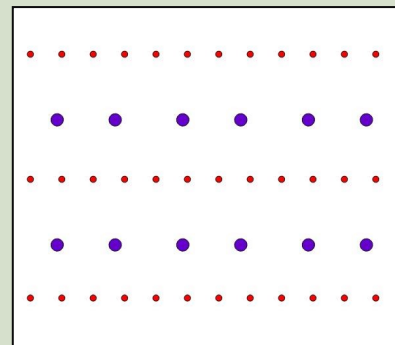
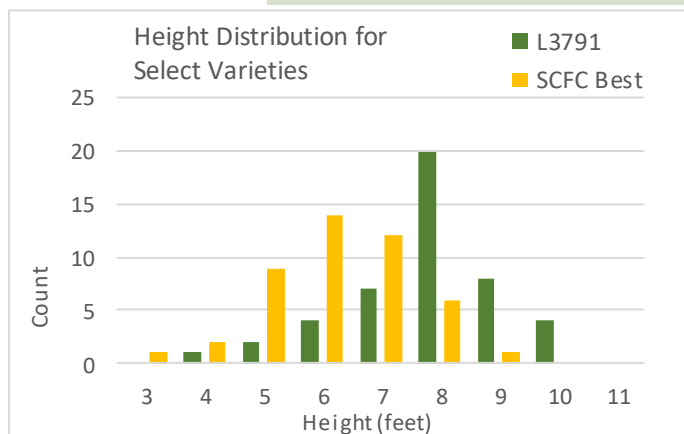


Illustration of FlexStand planting design.



After three growing seasons, height of both varieties follow a normal distribution with Cellfor L3791 showing dominance in the taller height classes.

Eucalyptus/Pine Biomass Study



Purpose: To compare seedling survival and growth rates among two fast-growing loblolly pine selections and *Eucalyptus benthamii*. This is a demonstration planting and it is not intended to replace replicated research studies.

Soil Description: Dominated by a Norfolk loamy fine sand. Deep, and well drained with water table more than 6' below surface. Site Index: 86. An intrusion of Rains fine sandy loam is present across the *E. benthamii* planting (see map), which is a deep, poorly drained soil, with the water table at or near the surface for ~6 months during most years. Site Index: 94. Both soils are medium in natural fertility and low in organic matter content.

Stand Establishment: Site was chemically site prepared with a Garlon/ Accord XRT mix at a cost of \$60/acre, then burned, scalped and subsoiled (\$76/acre). Two varieties of loblolly pine, ArborGen's AVG-125 and SCFC's 2nd Gen Coastal BF, were planted in early 2013 at a spacing of 5 ft X 10 ft. *E. benthamii* seedlings were also planted at a spacing of 5.5 ft x 10 ft in April 2013, after the risk of a late freeze had passed. The cost of *E. benthamii*, AVG-125, and SCFC 2nd Gen Coastal BF seedlings were \$400/1K, \$325/1K and \$62/1K, respectively. Hand planting costs were \$60/acre. The *E. benthamii* stand was fertilized with Triple Super Phosphate (TSP – 00-44-00) at 140 pounds/acre at the time of stand establishment. TSP was applied to the pine stands late in their 2nd growing season. The cost of TSP fertilization was \$61/acre. Herbaceous weed control was not completed as recommended in the first growing season due to frequent rainfall in early summer 2013. The stand has been mowed once per year to minimize shading from herbaceous weeds. Total establishment costs are \$574/ac (*E. benthamii*), \$540/ac (AVG-125) and \$311/ac (SCFC).

Seedling Variety	Ht (ft)	GLD (in.)	Surv. (%)
<i>Eucalyptus benthamii</i>	6.6	1.1	91.4
SCFC 2nd Generation Coastal BF	4.3	1.1	95.5
ArborGen AVG-125	5.18	1.2	99.5

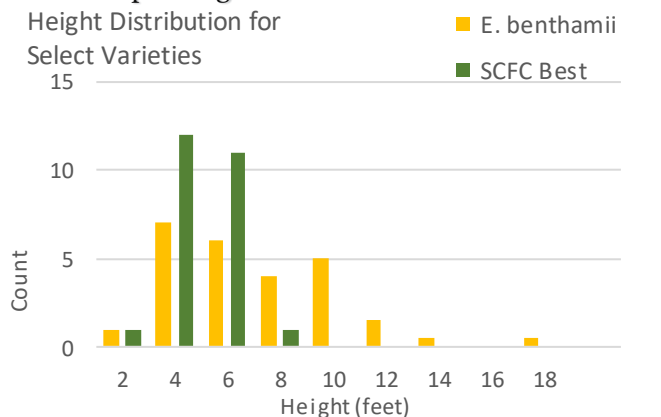
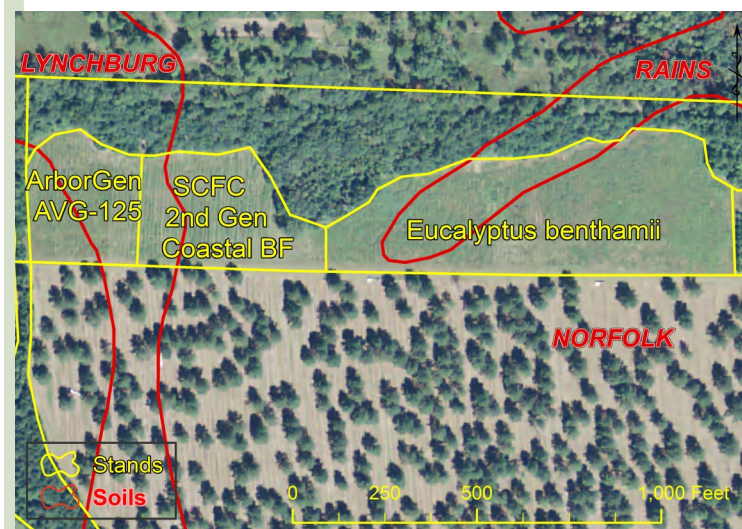
Summary: *E. benthamii* showed greater height potential, but also large variability in height distribution. For pines, height distribution was relative narrow and consistent for both varieties. Excellent survival was assessed across all plantings.



A select *Eucalyptus benthamii* at 4 months old.



SCFC 2nd Generation Coastal Best Family @ 4 months.



After two growing seasons, maximum height of *E. benthamii* greatly exceeded that of SCFC Best, however there is considerable overlap in height categories between the two species.

Cellfor Demonstration Planting



Purpose: To demonstrate variation in growth and form across a wide range of genetically-improved loblolly pine planting stock.

Soil Description: Entire planting site in Norfolk (NoA) loamy fine sand. A deep, well drained soil with water table more than 6' below surface. Medium natural fertility and low organic matter content. Site Index: 86.

Stand Establishment: Site was planted in 2005. Site prep included disk-ing only, and herbicide treatment was conducted during the first two growing seasons. Stand was sub-soiled after second growing season. Seven varieties of loblolly were planting on a 10 ft x 10 ft block spacing (see table) except L3519, which was 9 ft x 10 ft. Total establishment costs were ~\$188/ac, excluding the cost of seedlings (data unavailable, but comparable seedlings may increase costs between \$30 -

Variety	Ht (ft)	DBH (in)	Rust (% infected)	Straight (rank)	Fork/Ram (% impacted)	Vol (tons/acre)
7-56 OP	54.3	8.1	5.9	1.8	47.2	140.2
1.5 CA CSO	49.5	7.9	5.6	1.9	28.9	138.8
L3514	51.7	7.7	0.0	1.4	5.6	124.8
O3621	50.3	7.3	2.8	1.5	5.6	116.6
Q3802	48.9	7.4	0.0	1.6	16.7	104.5
K3973	44.2	6.8	2.8	1.4	16.2	87.4
L3519	36.8	6.0	13.5	1.4	9.3	68.7

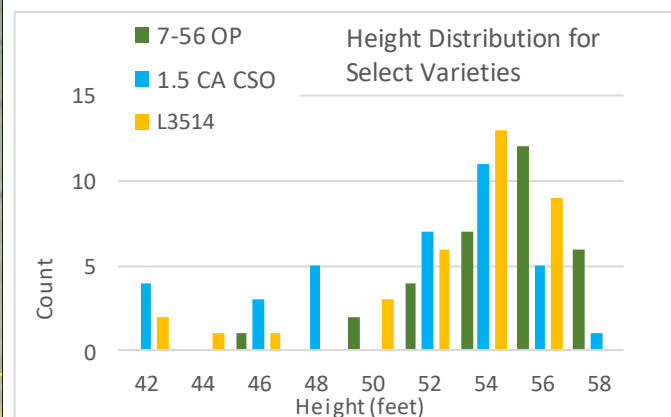
Summary: A wide range of volumes was found across varieties, with three producing over 120 tons/acre at age ten. Forking and branch attachment are concerns for the two most productive stands (7-56 OP & 1.5 CA CSO), while the best clonal variety, Cellfor L3514, showed high productivity with low forking and rust, and good stem form.



1.5 CA CSO has large diameter trees present, but higher mortality.



L3514 exhibiting excellent stem form, with over 97% survival at year 10.



Height distributions for the three most productive varieties after 10 growing seasons. 7-56 OP is significantly taller than all other varieties (95% confidence level).